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CANTOR COLBURN, LLP 55 GRIFFIN ROAD SOUTH BLOOMFIELD, CT 06002			EXAMINER CHEN, KEATH T	
			ART UNIT 1762	PAPER NUMBER
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

# Office Action Summary

Application No.

10/550,753

Applicant(s)

IWAMOTO ET AL.

Examiner

Keath T. Chen

Art Unit

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

## Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- 1) ☒ Responsive to communication(s) filed on 02 August 2007.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

- 4) ☒ Claim(s) 1-4 and 6-11 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-4 and 6-11 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

## Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 02 August 2007 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

## Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

## Attachment(s)

- |  |   |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)                     | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____                                      |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)          | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____  | 6) <input type="checkbox"/> Other: _____                          |

## **DETAILED ACTION**

### ***Response to Amendment***

Amendment on drawing and specification filed on 08/02/2007 to comply with 37 CFR 1.84(p)(4) is accepted.

The claim amendment filed on 08/02/2007, addressing claim 1-11 rejections from the first office action (05/16/2007) and canceling claim 5, is acknowledged and will be addressed below.

### ***Response to Arguments***

1. The anticipation rejection based on Takagi (US 5445676) is withdrawn.
2. Applicant's arguments on the obviousness rejection of claim 5 based on Moore et al. (US 5683518, hereafter '518) and Ushikoshi (US 5683606, hereafter '606) have been fully considered but they are not persuasive.

Applicant's arguments based on that '518 "teaches away" from using a heater formed on a substrate holding surface of the substrate holding unit", by admitting that in '518 "Moore considered the use of a heater that would directly contact the wafers, but rejected this configuration in favor of the device with a susceptor between the heater and the wafers"; therefore convincing argue that '518 anticipates claim 1 (after amendment). See MPEP 2131.05, "A reference is no less anticipatory if, after disclosing the invention, the reference then disparages it". '518 disclosure is being pointed out by the applicant's admission.

Applicant states further that "there would be a temperature differential between the center and perimeter of each wafer 210" to support that '518 "teaches away".

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However, '518 also recognizes the deficiency "the thermal mass of susceptor 201 increases the heat-up and cool-down times" and provides motivation for better temperature management and trade-off of various thermal response attributes. Therefore, '518 does not "teach away" a heater below the substrate. As a result, argument that '518 and '606 cannot combine based on MPEP2145.X.D.2 is moot.

From the above reasons, claim 1 rejection from the first office action is maintained.

For claims 2-4 and 6-11, applicant's argument of patentability is each based on the allowability of claim 1. As claim 1 rejection stands, all claims 2-4 and 6-11 are rejected.

### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

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1. Claims 1-4 and 6-8 are rejected under 35 U.S.C. 103(a) as being unpatentable over '518, in view of Ushikoshi et al. (US 5683606, hereafter '606).

'518 teaches some limitations of claim 1:

A deposition system (Fig. 3B, #320) which supplies a source gas and a purge gas alternately (col. 10, lines 63-66) for deposition, comprising: a deposition chamber (#303); a substrate holding unit which holds a substrate in the deposition chamber (#304); a source gas supply unit which supplies the source gas to the deposition chamber; a reactive gas supply unit which supplies a reactive gas to the deposition chamber; a purge gas supply unit which supplies the purge gas to the deposition chamber (#314a and #314b, see more discussion below); an exhaust unit which exhausts the source gas, the reactive gas, and the purge gas from the deposition chamber (exhaust lines #309a and #309b; and a vacuum pump, col. 33, lines 7-10 applies to Fig. 3B); a first heating unit (#327) which heats the substrate arranged in the deposition chamber to maintain the same to a predetermined temperature (col. 16, 2<sup>nd</sup> paragraph); and a second heating unit (#310) which heats the substrate arranged in the deposition chamber rapidly (col. 15, 2<sup>nd</sup> paragraph, describes #310 in Fig. 3A is capable of quickly heat the wafers. Since #310 in Fig. 3B is the same as #310 in Fig. 3A, see col. 15, 7<sup>th</sup> paragraph, the heating unit #310 in Fig. 3B is capable of heating the deposition chamber rapidly).

Although only two gas inlets are shown in Fig. 3B, '518 teaches 2-10 gas injection jets can be used (col. 30, lines 47-52), requiring a gas supplying unit associated with each injection jet. Therefore, '518 discloses using 3 gas inlets which

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can input 3 different gases and is capable of supplying a source gas, a reactive gas, and a purge gas. '518 also teaches the application in CVD (col. 19, lines 2-13).

'518 does not teach other limitation of claim 1:

The first heating unit is a heater formed on a substrate holding surface of the substrate holding unit.

'606 is an analogous art in the field of CVD (col. 1, lines 6-11), particularly in heating devices. '606 teaches that the heating efficiency of indirect heaters is not good (col. 1, lines 14-21). '606 provides a ceramic heater (Fig. 6, #22) to hold wafer (#4, col. 11, lines 31-39). Therefore, '606 provides a heater formed on a substrate holding surface of the substrate holding unit.

At the time the invention was made, it would have been obvious to a person of ordinary skill in the art to have adopted the ceramic heater of '606 as part of the substrate holding unit of '518, instead of the indirect heating method using a separate susceptor ('518, Fig. 3B, #302) and heater (#307). The motivation would have been to solve the heating efficiency problem associated with indirect heater ('606, col. 1, lines 14-21). Therefore, it would have been obvious a person of ordinary skill in the art to have combined '606 with '518 to have obtained the invention of claim 1.

'518 teaches the additional limitation of claim 2:

The first heating unit (Fig. 3B, #327) and the second heating unit (#310) are opposed to each other with the substrate (#311) interposed therebetween, so that the first heating unit heats the substrate from the backside and the second heating unit heats the substrate from the surface.

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'518 teaches the additional limitation of claim 3:

The second heating unit (#310, a radiant heat source, col. 15, 2<sup>nd</sup> paragraph) is an RTP (Rapid Thermal Processing) unit (Applicant's specification demonstrates that radiant heat sources are RPT units, [0025]).

'518 teaches the additional limitation of claim 4:

The second heating unit (#310, outside the wall #301c) is arranged outside the deposition chamber (#303).

'518 teaches the additional limitation of claim 6:

The substrate holding unit has a moving mechanism (Fig. 2C, #202 which is fairly suggested with any embodiment including Fig. 3B) which moves the substrate in position so that the distance between the substrate and the second heating unit can be adjusted by an operation from outside the deposition chamber without opening the deposition chamber (col. 9, line 66 to col. 10, line 1).

By adjusting position control #202 during (col. 9, line 67) deposition processing requires the distance adjustment is made outside the deposition chamber without opening the deposition chamber.

'518 teaches the additional limitation of claim 7:

Further comprising an annealing gas introducing unit which introduces an annealing gas into the deposition chamber.

'518 cites annealing as one of the use of the reactor (col. 51, 2<sup>nd</sup> paragraph and col. 11, 4<sup>th</sup> paragraph), requiring an annealing gas introducing unit is present.

Furthermore, '518 provides 2-10 gas injection jets (col. 30, lines 47-52) while claim 6 requires 4 gas supply units.

'518 further teaches the additional limitations of claim 8:

An annealing gas introducing unit which is capable of introducing an annealing gas into the deposition chamber (Fig. 4B, #408a is capable of supplying annealing gas through gas injection head #414, col. 21, lines 41-43), and wherein when the substrate is put closer to the second heating unit by the moving mechanism, the substrate or the substrate holding unit sections the deposition chamber into a first chamber (as motor #415 moves substrate holder between #414 and #421a, it sections the chamber into two sections) having the annealing gas introducing unit (first chamber is above the substrate holding unit including #414) and a second chamber (the chamber space below the substrate holding unit, including #421a) having the source gas supply unit and the reactive gas supply unit (the gas supply #408b and gas injection jet #421a is capable of supplying source gas and reactive gas, col. 21, lines 44-49. See also col. 25, lines 66 -67, more than one gas can be feed into the chamber #403) so that the surface of the substrate is exposed to the first chamber.

2. Claims 9-11 are rejected under 35 U.S.C. 103(a) as being unpatentable over '518 and '606, as applied to claim 6 above, and further in view of Suflarto et al. (US 6395092, hereafter '092) and Kusuda (US 20020195437, hereafter '437).

'518 and '606, together, teach all the limitations of claim 6, as discussed above. '518 further teaches the use of a process computer controls temperature process controls, power control, etc. (therefore, controls the second heating unit among many



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other components) (col. 50, lines 19-22) and sequence the particular process. The purpose of '518 is to form a silicon oxide layer (col. 11, line 66 to col. 12, line 3).

'518 does not teach the use of the above process computer to include the control the moving mechanism ('518, Fig. 2C, #202).

'092 is an analogous art in the high deposition rate of silicon oxide layer. '092 teaches the integrated control of many subcomponents in processing sequence, including the substrate positioning (Fig. 1F, #80, capable to control the desired height of substrate in the chamber, col. 9, lines 10-16) and the heater control (#87).

At the time the invention was made, it would have been obvious to a person of ordinary skill in the art to have integrated the position control component, as provided in '092, in the process computer discussed in '518. The motivation would have been to reduce the hardware cost and reduce the time required to configure the entire system ('518, col. 50, 2<sup>nd</sup> last paragraph). Therefore, a person of ordinary skill in the art would have known to devise a control unit which controls the operation of the second heating unit ('518, Fig. 3B, #310) and the moving mechanism ('518, Fig. 2C, #202), among other components.

'518 further teaches a short annealing time at high temperature after ion implantation (col. 11, lines 31-42). '518 and '092, together, did not explicitly teach the limitation of claims 9-10:

The control unit being configured to start heating the substrate by using the second heating unit after the substrate is put closer to the second heating unit by the moving mechanism.

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'437 is an analogous art in the rapid heat treatment of semiconductor wafer, particularly in carrying out an ion activation ([0005]). '437 specifically points out a problem of blunt profile during annealing even when raising the temperature fast ([0005], lines 3-5) and provides a solution for a fast annealing method. '437 teaches the loading of wafer and turning on the first heater (Fig. 5, heating plate #74, [0069]), raising the wafer position in the chamber (Fig. 6, [0070]), then turn on the second heating unit (flash lamp, #69, [0072]).

At the time of the invention was made, it would have been obvious to a person of ordinary skill in the art to have sequenced a processing sequence in the process computer that he had devised to turn on the second heating unit after raising the substrate in the process chamber, in order to achieve the desired temperature profile (such as Fig. 3 in '437). A person of ordinary skill in the art would have known that heating is more effective when the substrate is closer to the heat source. The motivation would have been to achieve short annealing time required by '518 and to avoid a blunt dopant profile in the wafer by the teaching of '437. Therefore, it would have been obvious to have combined '437 with '518 and '092 to have obtained the invention of claim 9 with a reasonable expectation of success.

For claim 10, '518 also provides a capability to introduce an annealing gas, as discussed in claim 7 rejection above. '518 further teaches that the process computer includes the control of gas panel (Fig. 16A, #1601, col. 50, lines 7-10), including the annealing gas line.

For the same motivations as discussed above (to reduce the hardware cost and reduce the time required to configure the entire system), it would have been obvious to a person of ordinary skill in the art to have included the control of moving mechanism in the process computer controlling the second heating unit and the annealing gas introducing unit, and to have sequenced a processing sequence to turn on the second heating unit after raising the substrate in the process chamber (to achieve the desired temperature profile), to have obtained the invention of claim 10 with a reasonable expectation of success.

For claim 11, '437, '518, and '092, together, teaches all the limitations of claim 9, as discussed above. '518 further teaches that the process computer includes the control of the exhaust unit (Fig. 16A, col. 49, line 65 to col. 50, line 6).

For the same motivations as discussed above (to reduce the hardware cost and reduce the time required to configure the entire system), further motivation being to make it easier for the computer control of the interrelated gas distribution and scrubbing (col. 50, lines 14-18), it would have been obvious to a person of ordinary skill in the art to have included the control of exhaust system to have obtained the invention of claim 11 with a reasonable expectation of success. (This deposition system is inherently capable of exhaust air from the entire deposition chamber when the substrate is put away (retracted) from the second heating unit by the moving mechanism.)

3. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP

§ 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Keath T. Chen whose telephone number is 571-270-1870. The examiner can normally be reached on M-F, 8:30-5:00 EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Michael Cleveland can be reached on 571-272-1418. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only.

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MICHAEL B. CLEVELAND  
SUPERVISORY PATENT EXAMINER